NON-PUBLIC?: N
ACCESSION #: 9208030202
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Oconee Nuclear Site, Unit 3 PAGE: 1 OF 07

DOCKET NUMBER: 05000287

TITLE: Reactor Trip Results From A Momentary Loss of Integrated Control System Power Due To Manufacturing Deficiency And Design Deficiency
EVENT DATE: 06/24/92 LER #: 92-003-00 REPORT DATE: 07/24/92

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: F SYSTEM: JX COMPONENT: XC MANUFACTURER: E353
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On June 24, 1992, at approximately 1411 hours, while operating at 100 percent Full Power, Oconee Unit 3 tripped as a result of a momentary loss of the Integrated Control System power from power panelboard 3KI. During the implementation of a Nuclear Station Modification, a wiring problem was encountered with the installation of an indicator, resulting in a ground fault on power panelboard 3KI. An investigation revealed that the vendor has the same part number for two different indicators. The two root causes of this event were a Manufacturing Deficiency (Deficient communication, Lack of communication) and Design Deficiency (Deficient documentation, incomplete documentation). Corrective actions include the evaluation of the inverter and static switch performance which led to the momentary loss of 3KI and review of exempt changes and Nuclear Station Modifications that include Dixson Indicators.

END OF ABSTRACT

BACKGROUND

The Integrated Control System (ICS) EIIS,JA! provides fully automatic control of reactor power, steam generation rate, and generated load by processing selected signals of measured plant parameters. The Feedwater Control Subsystem EIIS:JK! of the ICS is designed to maintain a total feedwater flow equal to the feedwater flow demand. One of the tasks accomplished by the Feedwater Control Subsystem is a Steam Generator (SG) high level limit. If controls fail to maintain this limit, a high level trip of the Main Feedwater Pumps and Mail Turbine EIIS:TA! will occur simultaneously. An Anticipatory Trip of the Reactor will occur as the result.

The ICS Power System is composed of a 125 VDC isolating transfer diode assembly 3ADF, a static inverter 3KI, an external inverter bypass 3KI, an isolation transformer 3KI and panelboard 3KI. The static inverter unit consists of a static inverter, a static transfer switch, and an internal manual bypass switch. The external inverter bypass unit consists of three breakers. The output of the inverter is synchronized with the AC Regulated Power System through the static switch to minimize transfer time from the inverter to the alternate supply. A backup transfer switch is provided for automatic transfer of system loads to the alternate power source should the inverter and static transfer switch become unavailable.

The Reactor Protection System EIIS:JC! (RPS) is a basic 2 out of 4 coincidence logic system. Logic within the system provides output signals to trip the reactor when plant setpoints and conditions are exceeded.

The Emergency Feedwater System EIIS:BA! will actuate on loss of both Main Feedwater Pumps (MFDWP). The actual initiating conditions are low discharge pressure on both MFDWPs and/or low hydraulic oil pressure on both MFDWPs.

The Low Pressure Service Water System EIIS:BI! (LPSW) provides normal and emergency cooling for various components throughout the plant.

Nuclear Station Modification (NSM) 32590 Part ALI replaces the existing pneumatic LPSW header discharge pressure instrumentation with electronic devices. The wiring scheme for this NSM was designed to accommodate a Dixson Indicator which has been internally wired so that pin 17 is the chassis ground and pin 1 is the power supply.

EVENT DESCRIPTION

On June 24, 1992, Unit 3 was operating at 100 percent full power. Nuclear Station Modification (NSM) 32590 part ALI was being performed in accordance with procedure TN/3/A/2590/00/ALI (Replacement of Low Pressure Service Water Pressure (LPSW) Transmitters PT50 and PT51 and LPSW Pressure A and B Indicators).

At approximately 1400 hours, the Instrument and Electrical (IAE) Technicians notified Operations that the LPSW pressure indicator was ready to be energized for a functional check. A Nuclear Equipment Operator (NEO) was sent to close breaker 3KI-15 in the ICS Power Panelboard 3KI. Upon closing breaker 3KI-15 the NEO heard abnormal noises from associated equipment and immediately reopened the breaker. The NEO immediately notified the Unit 3 Control Room of her observations and actions.

At 1411:07 hours, Unit 3 tripped due to the momentary loss of the 3KI power panelboard. Immediately following the loss of the 3KI power panelboard, both Main Feedwater Pumps and the Main Turbine tripped as a result of the false high Steam Generator Level signal. The reactor tripped on a Reactor Protective System anticipatory trip signal.

All full length control rods EIIS:ROD! fully inserted into the core and the reactor was shutdown.

The A and B Motor Driven Emergency Feedwater Pump (MDEFDWP) automatically started at approximately 1411 hours and were secured at approximately 1528 hours. The Turbine Driven Emergency Feedwater Pump automatically started at approximately 1411 hours and was secured at approximately 1419 hours.

Specific post-trip parameters remained in acceptable limits. Reactor Coolant System (RCS) EIIS:AB! average temperature decreased from 580 degrees F and stabilized at approximately 551 degrees F. RCS pressure decreased from approximately 2150 psig to 1787 psig. Pressure then slowly increased to approximately 2270 psig. Pressurizer EIIS-VSL! level reached a minimum of 55.2 inches and stabilized at approximately 160 inches. SG pressures reached a post-trip high of 1094 psig before stabilizing at approximately 997 psig. SG levels decreased to a minimum of 27 inches and was maintained at approximately 28 inches by the Emergency Feedwater System.

Immediately following the Reactor Trip, an investigation was started which revealed that a momentary loss of 3KI power panelboard occurred when 3KI-15 was closed. The immediate cause was a ground fault resulting from the internal cross connection between pin 1 (power supply) and pin 17 (externally designated as chassis ground) of the Dixson indicator being installed by the NSM.

The ground fault caused the static inverter to reach a current limit and
thus reduce output voltage. Upon loss of the inverter output, the static switch transferred to its alternate power source. The 80 amp fuse in the static transfer switch associated with the inverter's alternate power source subsequently blew, causing a total loss of power to panelboard 3KI. The loss was detected by the Backup Transfer Switch, which transferred to its emergency position in approximately 0.5 seconds. However, during this time, the loss of power to the steam generator level instruments resulted in a false high level indication which caused the trip.

The reactor was returned to criticality on June 25, 1992 at approximately 0001 hours.

Subsequently, the investigation continued in order to determine why the Dixson indicator had been wired with this connection to ground. It was determined that the indicator was wired in accordance with the NSM design drawings, and that the drawings were based upon a version of the Dixson instruction manual. However, upon review of the Oconee Manufacturer's (OM) drawings, it was observed that OM-333-379 consisted of three versions of the Dixson instruction manual. Two versions were designated as PN 072- 50766 and PN 072-50766C. Review of the diagrams contained within these manuals showed that these versions (the " " and "C"), showed pins 1 and 17 connected by an internal jumper, and pin 13 was designated as the chassis ground. The third version was designated by Dixson as part number PN 072-50766* and indicated that no jumper existed and showed pin 17 as the chassis ground.

Interviews with involved personnel revealed that the "*" version had been used to design the modification and order the indicator. The indicator which was received from Dixson was marked with the specified part number but was configured in accordance with version "C" of the manual. Personnel at Dixson were consulted and confirmed that both configurations had been made and shipped under the same part number.

Apparently, the configuration without the internal jumper, the "*" version, was the original design. A number of indicators of this version were shipped for installation under various NSMs and exempt changes.

However, another version, with a distinct part number, had been manufactured for safety related applications and had required the internal jumper to be installed to meet seismic qualifications. Dixson decided to use the safety related design in both applications, and shipped a number of these with the internal jumper and the " " version of the installation manual, with the same part number as the previous configuration. The Dixson personnel consulted did not know why the same part number had been used for items with a functionally different configuration. One of the indicators with this configuration was actually installed at Oconee first, and this version of the manual was the version initially issued as OM-333-379.

Subsequently, Dixson included a revised version of the manual (the "C" version) in later shipments. As the various indicators were installed and the associated documentation returned to Design Engineering for document update, the "C" and "*" versions were both added to OM-333-379 at the same time. The "C" and "*" versions were not dated or otherwise annotated to indicate which version was the current version. Also, there was no indication added to the OM as to which version was applicable to which indicator, either by application or by manufacture date.

Because this type of indicator has been used extensively in recent upgrade modifications at Oconee, several other indicators with the same part number were on hand as spare parts. One of these was inspected and determined to be the "*" version, indicating that both versions have been used at Oconee.

In order to avoid future compatibility problems with the different versions, a design change was performed to revise the wiring for NSM 32590 so that pin 17 is not connected external to the indicator. A design review will be performed to assure that all applications are compatible with both versions. Most of the existing applications involved direct replacement of Bailey "RY" indicators (not "PY" as in this case), which did not use pin 17.

CONCLUSIONS

One root cause of this event is Manufacturing Deficiency (Deficient Communications, lack of communications). When revising the Dixson indicator, part number BG202AXTX4/20MADCV, the Dixson company did not revise documentation adequately to permit any differentiation between the various versions, even though substantive changes occurred in the terminal configuration.

A second root cause is Design Deficiency (Deficient Documentation, incomplete documentation). Duke Power Design Engineering, now the Oconee Engineering Division (OED)!, reviewed two different versions of the Dixson instruction manual and included both versions in OM-333-379 (along with the original version of the manual) without providing any indication or method of how to determine which manual was applicable to which application or instrument in the field. This deficiency should have been apparent because both revised versions were marked as received by Design Engineering Document Control on the same date and were incorporated into the OM as part of the same revision. It appears reasonable that the reviewer(s) should have questioned what differences existed between the different documents and indicators, and how applicability could be determined.

Discussions with various individuals in OED indicated that the problem of identifying applicability of vendor design and/or document changes to existing equipment is not unique. However, if an official policy existed to address this problem, the individuals consulted were not aware of it.

The Dixson indicator did not fail and, therefore, is not NPRDS reportable. The failure of the 3KI inverter static switch due to the blown fuse is NPRDS reportable. The manufacturer of the inverter is Exide Industry and the model number is 120/9.F1. OED is evaluating the momentary loss of 3KI to determine the cause of failure.

Response of the primary system to the trip was normal. Reactor Coolant System inventory, pressure, temperatures were all maintained within the

normal post-trip envelope. The immediate response of the secondary system was also normal. Both steam generators' pressure and level were maintained at or near their proper setpoints.

A review of events over the last two years, indicates that this is not a recurring problem.

There were no personnel injuries, radiation exposures, or uncontrolled releases of radioactive materials associated with this event.

CORRECTIVE ACTIONS

Immediate

1. Operations personnel took appropriate actions in accordance with the Emergency Operating Procedure and Abnormal Procedures for Loss of KI, and Loss of Main Feedwater.

Subsequent

1. Nuclear Station Modification 32590 was postponed until the next Unit 3 Refueling Outage.

2. Replaced the blown 80 amp fuse in, the 3KI inverter.

Planned

1. Oconee Engineering Division personnel will evaluate the momentary loss of 3KI to determine the cause of failure. Subsequent corrective actions will be made based upon the results of the evaluation.

2. Revise OM-333-0379 to ensure it is correct and clarifies the specific indicators.

3. Review previous and planned exempt changes or Nuclear Station Modifications that include Dixson Indicators, which could possibly be designed such that they are not compatible between the two versions of indicators. If any such applications exist, appropriate design changes or administrative controls will be implemented to prevent use of incompatible versions.

4. Oconee Engineering Division management will assure that adequate methods exist to distinguish between different versions of vendor manuals and to determine which documents are applicable to which components. Training will be given to appropriate personnel to assure that these methods are adequately understood and implemented.

SAFETY ANALYSIS

The Integrated Control System (ICS) power supply is arranged such that it is normally powered from a dedicated static inverter system, which receives a DC input from the Vital Instrument and Control batteries, and is backed by an AC input from one of the plants regulated non-load shed buses. Both automatic and manual-transfer switching is provided to select between supplies.

In addition to the power supply reliability for the ICS, essential plant parameters necessary for shutdown have been arranged with their power supplies independent of the ICS source. Also, a "display group" has been developed and defined on the plant operator and computer such that upon a loss of ICS power, the operator may quickly have full and complete information on key primary and secondary system parameters. Emergency procedures have also been developed to designate alternate sources of information on key plant parameters if the computer is unavailable, thus assuring the operator can obtain sufficient systems information.

If a loss of ICS power event occurs, the ICS is designed to place the plant to a safe condition by initiating a trip of both Main Feedwater Pumps via the failsafe design of the high generator level monitoring circuits. These circuits are designed such that upon loss of either "hand" or "auto" power they will initiate a trip of the Main Feedwater Pumps and the Main Turbine simultaneously and also the reactor via the Anticipatory Reactor Trip System circuitry.

The health and safety of the public were not endangered by this event. It did not involve the uncontrolled release of radioactive material, overexposure to radiation, or personnel injuries.

ATTACHMENT 1 TO 9208030202 PAGE 1 OF 1

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DUKE POWER

July 24, 1992

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
Subject: Oconee Nuclear Site
Docket Nos. 50-269, -270, -287
LER 287/92-03

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), attached is Licensee Event Report (LER) 287/92-03, concerning a reactor trip.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton
Vice President

/ftr

Attachment

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